

## CLAIMS

### I/WE CLAIM:

1. A system for increasing the fuel storage volume and the fuel carriage capacity of external fuel stores suspended on an aerial vehicle by the formation of at least one external extended fuel stores configuration, the system comprising the elements of:
  - at least one dual functionality external fuel tank carrier pylon providing fuel tank carriage capability and fuel transfer and control capabilities from at least one externally carried fuel tank and to support fuel transfer and control capabilities for at least one associated single functionality external fuel tank carrier pylon carrying at least one external fuel tank;
  - at least one single functionality external fuel tank carrier pylon providing fuel tank carriage capability and fuel transfer and control capabilities from at least one externally carried fuel tank;
  - at least one externally mounted Stores Transfer Kit to provide at least one aerodynamically shaped enclosure for at least one external fuel line and at least one external fuel control line linking between the at least one single functionality external tank carrier pylon and the at least one dual functionality external tank carrier pylon;whereby an at least one alternative external fuel transfer and fuel control path is established between the at least one external fuel tank carried by the at least one single functionality external fuel tank carrier pylon and the fuel system of the aerial vehicle via the at least one externally mounted Stores Transfer Kit, and the at least one dual functionality external fuel tank carrier pylon.
2. The system according to claim 1 wherein the at least one dual functionality external fuel tank carrier pylon further comprises the elements of:

at least one fuel connector to link the fuel transfer system of the at least one dual functionality external fuel tank carrier pylon to at least one fuel connector of the aerial vehicle fuel system;

5 at least one compressed air connector to link the compressed air system of the at least one dual functionality external fuel tank carrier pylon to at least one compressed air connector of the aerial vehicle fuel control system;

10 at least one electric power and signal connector to link the electrical system of the at least one dual functionality external fuel tank carrier pylon to at least one electrical and signal connector of the aerial vehicle fuel control system;

15 at least one fuel connector to link the fuel transfer system of the at least one dual functionality external fuel tank carrier pylon to at least one fuel extension line installed in the at least one externally mounted Stores Transfer Kit;

at least one compressed air connector to link the compressed air system of the at least one dual functionality external fuel tank carrier pylon to at least one compressed air extension line installed in the at least one external externally mounted Stores Transfer Kit;

20 at least one electric power and signal connector to link the electrical system of the at least one dual functionality external fuel tank carrier pylon to at least one electrical and signal line installed in the at least one external externally mounted Stores Transfer Kit;

25 3. The system according to claim 1 wherein the at least one single functionality external fuel tank carrier pylon further comprises the elements of:

30 at least electrical connector to link the electrical control system of the at least one single functionality external tank carrier pylon to the fuel system of the aerial vehicle;

at least one fuel connector to link the fuel transfer system of the at least one single functionality external fuel tank carrier pylon to at least one fuel extension line installed in the at least one externally mounted Stores Transfer Kit;

5 at least one compressed air connector to link the compressed air system of the at least one single functionality external fuel tank carrier pylon to at least one compressed air extension line installed in the at least one externally mounted Stores Transfer Kit;

10 at least one electric power and signal connector to link the electrical system of the at least one single functionality external fuel tank carrier pylon to at least one electrical and signal line installed in the at least one externally-mounted Stores Transfer Kit.

15 4. The system according to claim 1 wherein the at least one externally mounted Stores Transfer Kit comprises the elements of:

at least one aerodynamically shaped external envelope to protect the enclosed internal elements and to provide aerodynamic efficiency to the aerial vehicle to which the extended external fuel stores configuration is applied;

20 at least one extension fuel line linking the fuel transfer system of the at least one single functionality external fuel tank carrier pylon to the fuel transfer system of the at least one dual functionality external fuel tank carrier pylon;

25 at least one extension compressed air line linking the compressed air system of the at least one single functionality external fuel tank carrier pylon to the compressed air system of the at least one dual functionality external fuel tank carrier pylon;

at least one extension electric power and signal link the electrical system of the at least one single functionality external fuel tank

carrier pylon to the electrical system of the at least one dual functionality external fuel tank carrier pylon.

- 5            5. The system according to claim 1 further comprises the elements of:  
at least one fuel quantity monitoring device to display the quantity  
of fuel store in the at least one external fuel tank carried by the at  
least one single functionality external fuel tank carrier pylon; at  
least one display device to indicate the status of the at least one  
external fuel tank and the status of the at least one single  
10            functionality external fuel tank carrier pylon;  
at least one control device to control the fuel transfer sequence from  
the operative fuel containers constituting the external extended fuel  
stores configuration.
- 15            6. The system according to claim 2 wherein the dual functionality  
external fuel tank carrier pylon further comprises a specific  
indicator to control the transfer sequence of the fuel stored in the at  
least one fuel tank suspended on the at least one single functionality  
external fuel carrier pylon and in the at least one external tank  
20            suspended on the at least one dual functionality external fuel tank  
carrier pylon.
- 25            7. The system according to claim 6 wherein the dual.. functionality  
external fuel carrier pylon further comprises a T-valve to control  
the transfer sequence of the fuel stored in the at least one external  
fuel tank suspended on the at least one single functionality external  
fuel tank carrier pylon and the fuel stored in the at least one external  
tank suspended on the at least one dual functionality external fuel  
tank carrier pylon.

8. The system according to claim 1 wherein the aerial vehicle is a multi-role military aircraft.
- 5 9. The system according to claim 8 wherein the aerial vehicle is a F-16 Fighting Falcon multi-role fighter aircraft.
- 10 10. The system according to claim 9 wherein the aerial vehicle is an Uninhabited Aerial Vehicle (UAV).
11. The system according to claim 10 wherein the aerial vehicle is a civilian aircraft.
12. The system according to claim 11 wherein the aerial vehicle is a multi-role rotary-wing aircraft.
- 15 13. The system according to claim 1 further comprises at least one external fuel container utilized as fuel storage means to supply energy means to the propulsion system of the aerial vehicle.
- 20 14. The system according to claim 13 wherein the at least one external fuel container is a 270-gallon tank.
15. The system according to claim 14 wherein the at least one external fuel container is a 600-gallon fuel tank.
- 25 16. The system according to claim 1 wherein the dual functionality external fuel tank carrier pylon is a standard external fuel tank carrier pylon converted to dual functionality role.

17. The system according to claim 16 wherein the at least one dual functionality external fuel tank carrier pylon is a novel, specifically designed and developed device.
- 5 18. The system according to claim 1 wherein the at least one single functionality external fuel tank carrier is a novel, specifically designed and developed device.
- 10 19. The system according to claim 1 wherein the elements of the extended external fuel stores configuration are transparent to the aerial vehicle.
20. The system according to claim 1 wherein the elements of the extended fuel stores configuration are detachably installed on an aerial vehicle.
- 15 21. The system according to claim 1 wherein the elements of the external extended fuel stores configuration include secondary control and emergency release means.
- 20 22. The system according to claim 1 wherein the at least one dual functionality external fuel tank carrier pylon is suspended on an inboard "wet" stores station having fuel transfer, control, refueling, monitoring, and jettisoning capabilities.
- 25 23. The system according to claim 1 wherein the at least one single functionality external fuel tank carrier pylon is suspended on at least one outboard wing "pseudo-wet" stores station having jettisoning capabilities.
24. The system according to claim 1 wherein the at least one outboard stores station is provided with a dual "pseudo-wet/dry" functionality allowing

and supporting the carriage of at least one single functionality external fuel tanker pylon and other pre-defined stores.

- 5        25. The system according to claim 4 wherein the externally mounted Stores Transfer Kit is substantially re-configurable according to the types and variants of the aerial vehicles to provide for optimal aerodynamic characteristics and acceptable flight envelope.
- 10       26. The system according to claim 4 wherein the externally mounted Stores Transfer Kit is operative in the transfer of fuel stores between at least two stores carriers.
- 15       27. The system according to claim 4 wherein the externally mounted Stores Transfer Kit is operative in the transfer of stores between an external store and an internal store.
- 20       28. The system according to claim 1 wherein the externally mounted Stores Transfer Kit is operative in the transfer of electronic countermeasures between at least two stores carriers.
- 25       29. The system according to claim 4 wherein the externally mounted Stores Transfer Kit is operative in the transfer of projectiles between at least two stores carriers.
- 30       30. A method for increasing the fuel storage volume and the fuel carriage capacity of external fuel stores suspended on an aerial vehicle by the formation of an external extended fuel stores configuration, the method comprising the steps of:  
converting at least one standard external fuel tank carrier pylon in order to provide support for the transfer, monitoring and control of a

fuel store held in at least one fuel contained suspended on an adjacent external fuel tank carrier pylon;  
developing at least one novel external fuel tank carrier pylon in order to provide the transfer of fuel stored in a carried external fuel tank to the aircraft fuel system via the at least one converted external fuel tank carrier pylon;  
developing at least one externally-mounted Stores Transfer Kit to provide external extension fuel and control lines between the at least one converted external fuel tank carrier pylon and the at least one novel external fuel tank carrier pylon;  
thereby forming an alternative external fuel transfer path between an at least one external fuel tank suspended on the at least one novel external fuel tank carrier pylon via the at least one external Stores Transfer Kit, via at least one converted external fuel tank carrier pylon, to the fuel system of an aerial vehicle.

31. The method according to claim 30 further comprising the steps of:  
designing the elements constituting the at least one external extended fuel stores configuration;  
ground testing the elements constituting the at least one external extended fuel stores configuration;  
flight testing the elements constituting the at least one external extended fuel stores configuration;  
altering the combination of the elements of the at least one external fuel stores configuration in accordance with the types and variants of an aerial vehicle  
certifying the at least one extended external fuel stores configuration.

32. The method according to claim 30 further comprises modifying in an ergonomic manner the Stores Control Console of the aerial vehicle by the addition of fuel gauges, fuel status displays, and fuel transfer selectors.

5 33. The method according to claim 30 further comprises modifying the control routines of the of the Stores Control Computer installed in the aerial vehicle to effect automatic and semi-automatic sequencing of the fuel transfer from the fuel containers of the extended external fuel stores configuration.

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34. The method according to claim 30 further comprises uploading the elements constituting the at least one external extended fuel stores configuration on an aerial vehicle in order to enable the performance of a mission requiring substantially large quantities of fuel.

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35. The method according to claim 30 further comprises preserving the original functionality of the functionally modified "pseudo-wet" stores stations.

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36. The system according to claim 1 wherein the externally mounted Stores Transfer Kit includes extension fuel lines and extension compressed air lines with a variety of gauge sizes.

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